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REPORT OF PINE-BEETLE SURVEYS ON THE MT. HOOD NATIONAL FOREST 1937-1939

Forest Insect Laboratory
445 U. S. Court House
Portland, Oregon

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REPORT OF PINE-BEETLE SURVEYS ON THE MT. HOOD NATIONAL FOREST 1937-1939

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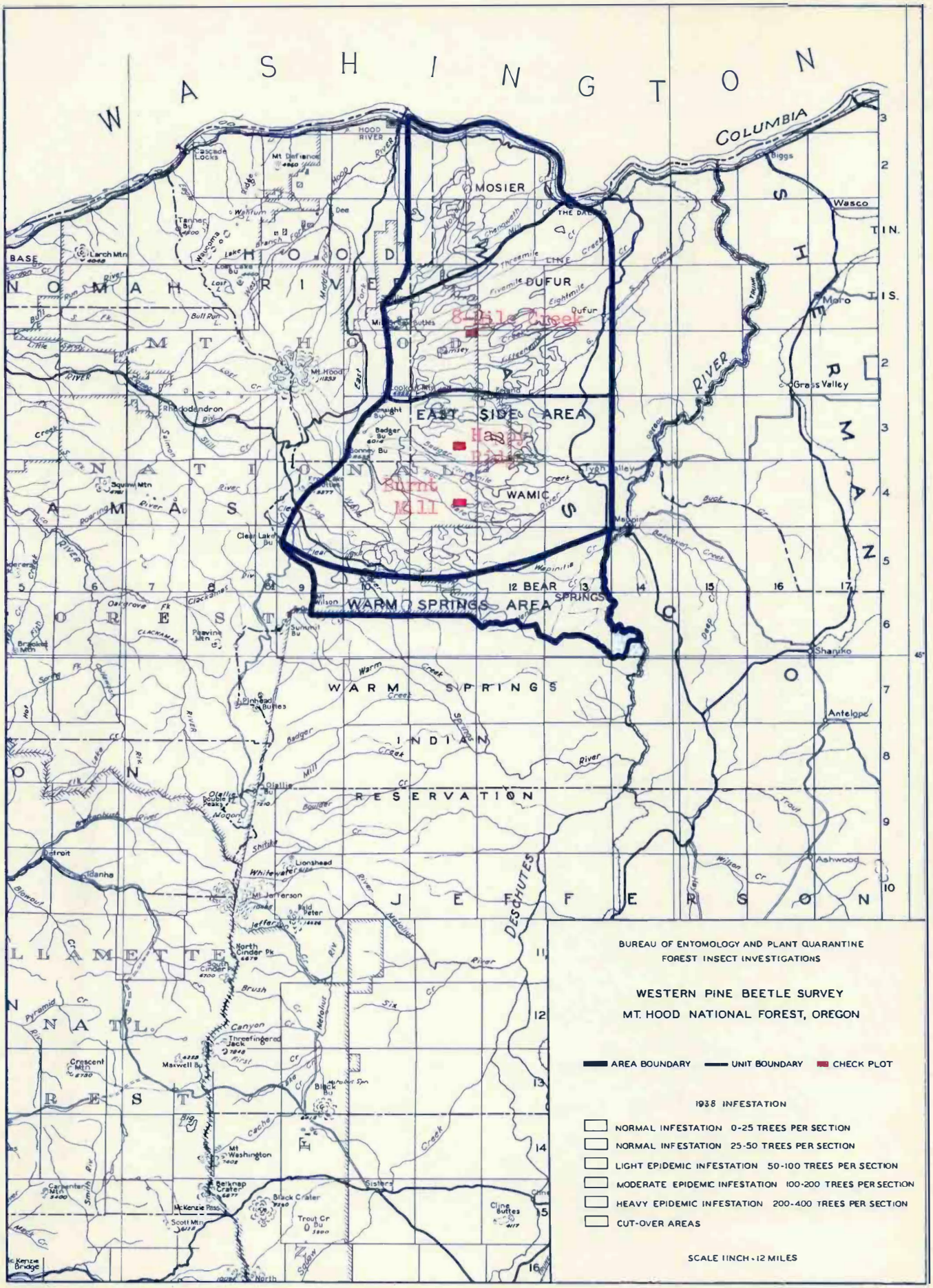
MAP 1.


WASHINGTON
COLUMBIA
MOSIER
DUFUR
EAST SIDE AREA
WAMIC
WARM SPRINGS AREA
WARM SPRINGS INDIAN RESERVATION
JEFFERSON
DESCHUTES
CLACKAMAS
WASCO
SHERMAN
Mt. Hood
Mt. Jefferson
Mt. Washington
Three Fingered Jack
Black Crater
Belknap Crater
Mt. Wilson
Mt. Defiance
Larch Mtn.
Squaw Mtn.
Rhododendron
Grass Valley
Shaniko
Antelope
Ashwood
Madras
Metolius River
Deschutes River
Warm Springs River
Badger Creek
Eightmile Creek
Fivemile Creek
Threemile Creek
Buck Creek
Trout Creek
Bear Springs
Burnt Hill
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BUREAU OF ENTOMOLOGY AND PLANT QUARANTINE
FOREST INSECT INVESTIGATIONS
WESTERN PINE BEETLE SURVEY
MT. HOOD NATIONAL FOREST, OREGON
AREA BOUNDARY
UNIT BOUNDARY
CHECK PLOT
1938 INFESTATION
NORMAL INFESTATION 0-25 TREES PER SECTION
NORMAL INFESTATION 25-50 TREES PER SECTION
LIGHT EPIDEMIC INFESTATION 50-100 TREES PER SECTION
MODERATE EPIDEMIC INFESTATION 100-200 TREES PER SECTION
HEAVY EPIDEMIC INFESTATION 200-400 TREES PER SECTION
CUT-OVER AREAS
SCALE 1 INCH = 12 MILES

Introduction.

From time to time forest officers have made observations of the insect conditions in the ponderosa pine stands within and adjacent to the Mt. Hood National Forest. To supplement these observations, systematic surveys were begun in 1937 and have been conducted annually since then. These surveys have been carried out through the cooperative effort of the Forest Service and Bureau of Entomology and Plant Quarantine.

The purpose of the surveys has been: (1) To follow the yearly trend and fluctuation of losses caused by forest insects, the most important of which is the western pine beetle (Dendroctonus brevicomis Lec.); (2) to ascertain the need of artificial control work in areas of epidemic infestation; and (3) to determine what trees and forest areas are most susceptible to beetle attack and warrant first consideration in timber management plans.

History of Surveys.

As part of the region-wide bark-beetle survey program carried out during 1937, three 320-acre check plots were established on the forest during the period September 13-15, 1937. These plots were again cruised during the periods October 12-15, 1938, and September 11-13, 1939. A list of these plots, with pertinent data for each, is given in table 1 and their locations on the forest are graphically shown on map 1.

In addition to the plot work, an extensive reconnaissance of all the pine stands was made during the latter part of October in 1938 and again in 1939.

Survey Methods.

These surveys have been both intensive and extensive in character. A crew consisting of five members in 1937 and three members during 1938 and 1939 carried out the intensive phase. This consisted of making a 100 percent cruise of the current beetle losses on the 320-acre plots. These losses are marked and recorded with pertinent data for each tree. In the course of establishing the plots, a 10 percent cruise of the green stand volume was made, using the strip method of cruising. The plots were again cruised during the survey of 1939, this time employing the individual 1/4-acre circular plot method. This method of cruising was carried on in conjunction with the regular spotting practice, requiring but a small amount of additional time. On both cruises, individual trees were rated as to their relative beetle susceptibility, and notes were taken on ecological conditions on the plots.

The extensive phase of the surveys was carried on by the writer. A reconnaissance was made of all the ponderosa pine stands, using plot data as a guide by which to gauge surrounding conditions. Ocular estimates of the beetle losses per section were made for the forest. To make these estimates, observations were made from seven primary or emergency lookouts, as well as from many other points of vantage and roads on the forest.

Personnel.

The personnel of the survey crews were employed through the office of the Regional Forester and worked under the technical direction of the Portland Forest Insect Laboratory. Field supervision was given by the writer. The names of crew members having part in the surveys on the Mt. Hood National Forest are herewith presented in chronological order:

1937.—Field Assistant V. I. Carter (Crew Leader), CCC Student Assistants J. F. McKenna, D. W. Moore, H. J. Ostlind, and C. Stephens.

1938.—Junior Field Assistant R. Goodall (Crew Leader), Under Field Assistants E. Brackett and H. J. Ostlind.

1939.—Junior Field Assistant R. Goodall (Crew Leader), Under Field Assistants H. J. Ostlind, and C. Wilson.

Each season prior to starting field work, members of all the pine-beetle survey crews for the region received training at Camp Sisters on the Deschutes National Forest. Two or three weeks of intensive instructions were given inexperienced members and those having previous experience received a few days' instruction.

Forest Description.

The portion of the Mt. Hood National Forest containing stands of ponderosa pine lies on the east slope of the Cascade Range and extends from the Columbia River on the north to the Warm Springs Indian Reservation on the south. The eastern edge of the forest adjoins open brush lands on streams tributary to the Deschutes River.

At the upper elevations, ponderosa pine is found in mixture with Douglas fir, but on the lower slopes some pure stands of ponderosa pine are found, extending to the timber edge where scattered stands mixed with scrub oak occur. The range in elevation of the more important pine stands is from about 2,000 to 4,500 feet.

Data from the inventory phase of the Forest Resource Survey 1/ show approximately 215,360 acres of ponderosa pine type on which there were some 1,172,152 M board feet of this species.

In this report ponderosa pine stands of private or other ownerships (Indian lands excepted) within or adjacent to the forest boundaries will be considered as part of the Mt. Hood National Forest.

Forest Utilization.

Utilization began when the early-day settlers supplied their wants from the forest. Later, as transportation facilities improved the demand increased, resulting in larger acreages being cut over. Data from the Forest Resource Survey show that some 21,000 acres of ponderosa pine, mostly on private holdings, had been cut over up to 1934, and additional acreage has been cut since then. The clear-cut method was generally employed on private lands, and the cuttings on forest lands were regulated according to Forest Service standards. Fortunately, nearly all the cuttings have been carried out in stands of high beetle hazard.

Area Description.

From an entomological viewpoint the ponderosa pine stands of the forest have been divided along natural topographic and timber type lines into so-called infestation areas, of which there are two--East Side and Warm Springs. These areas in turn have been subdivided into infestation units, of which there are four. The distribution of the pine stands by areas and units is given in Table 2. Their location on the forest is shown graphically on Map 1.

Loss History, 1931 to 1936.

Prior to the beginning of the survey in 1937, no systematic check or records had been made of the depredations of the western pine beetle in the ponderosa pine stands of the Mt. Hood National Forest. However, the number of beetle-killed trees and the stages of their deterioration indicate the infestation trend previous to the survey did not vary appreciably from similar infestations on neighboring forests having a longer series of records. In general, their history was that favorable epidemic conditions were created by the cumulative effect of drought conditions which began about 1917 and were becoming critical about 1930 to 1932, resulting in a serious reduction in the growth and greatly reduced vitality of the pine stands. The infestation began its upward trend during 1929 and 1930,

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1/ U.S.D.A. Pacific Northwest Experiment Station.--Forest Statistics for Wasco County, Oreg.--Paul D. Kemp, March 1, 1936.

reaching its greatest intensity during 1932. Extremely low sub-zero temperatures during the winter of 1932-33 caused a 61 percent2/ mortality to the overwintering bark-beetle broods. As a result of this high mortality, coupled with some improvement of tree growth, the infestation declined, reaching a low point during 1936.

During the above-described epidemic cycle, the pine stands of the forest were badly depleted, especially at lower elevations on marginal sites--where the mature ponderosa pine stands have been nearly wiped out.

During the six-year period 1931-36, it is estimated that 86,300 M board feet, or 9.2 percent of the entire pine stand, were killed. Practically all of the loss occurred during the period 1931-33.

Losses on Check Plots, 1937-39.

A summary of the pine-beetle losses and a comparison of infestation trends on the check plots from 1937 to 1939 are shown in table 3. As less than 61 percent of the total 1939 loss had developed at the time of survey, the probable total of the 1939 loss was estimated by employing a factor based on the probable percent of the total season's loss present on date of cruise. Although subject to considerable error, it does give an indication of the probable trend of the 1939 infestation.

These data show increases of infestation occurred on all plots during both 1937 and 1938, and a probable increase on the Happy Ridge Plot during 1939. The infestation on the other two plots declined to some extent but still remains abnormally high. During this three-year period, total losses on the plots amounted to 5.17 percent of the stand, indicative of moderate to heavy epidemic infestation. With two of the three plots showing some decrease of infestation and the smaller size of groups killed during 1939, indications are that the infestation again may be assuming a downward trend.

Reconnaissance Estimates, 1937-1938.

Estimates of the 1937 and 1938 beetle losses on the forest as a whole are given by areas and units in table 4 and are shown graphically on map 2 for 1937 and on map 3 for 1938.

During 1937 the infestation trend was upward. Areas of light epidemic infestation were found on all except the Mosier Unit. A concentration of aggressive moderate epidemic was also found on the Wamic Unit.

2/ Low Temperatures as a Limiting Factor in Western Pine Beetle Epidemics.--F. P. Keen, Entomologist, and J. A. Beal, Assistant Entomologist. April 20, 1933.

The infestation trend continued upward during 1939. Areas of light epidemic present last season appeared to have moved back into the better stands, and a moderate epidemic infestation appeared in their place. On the Wamic Unit, a heavy epidemic developed over a large portion of the area formerly occupied by moderate epidemic infestation.

This continuous high level of infestation is in a large measure due to the inability of the stands to recover from drought conditions. Increment cores taken from trees on the check plots show that although there has been some improvement in growth it is still far below normal.

Recommendations.

Under the present complications of drought and over-maturity of the ponderosa pine stands, it is believed inadvisable to attempt artificial direct control work to halt the present aggressive epidemic of the western pine beetle. The solution of this problem is believed to be one of timber management, involving a selective cutting program whereby all of the trees of high beetle hazard would be removed from the forest.

The presence of this type of tree in the stands not only maintains the infestation during periods of lessened beetle activity, but also enables infestations to quickly develop to a point of aggressiveness, during which the more vigorous trees of the stand are attacked and killed.

Unless such steps are taken or a definite change of weather conditions more favorable to tree growth occurs, beetle losses in the ponderosa pine stands can be expected to continue until the host material of the western pine beetle is no longer available.

Summary.

Within and adjacent to the boundaries of the Mt. Hood National Forest, there are some 215,360 acres of ponderosa pine type having 1,172,152 M board feet of this species.

Through the cooperative efforts of the Forest Service and Bureau of Entomology and Plant Quarantine, the western pine beetle surveys were begun in 1937 and have been conducted annually since then. These surveys are both extensive and intensive in character. The intensive phase covered three 320-acre check plots, and the extensive phase covered all the pine stands of the forest growing over some 215,360 acres.

Check plot data show that the infestation trend was upward through 1937 and 1938, with a possible decline during 1939. The extensive reconnaissance revealed that during 1937 extensive areas of light epidemic existed on all except the Kosier Unit. In addition, a sizeable area of moderate epidemic existed on the Wamic Unit.

A general increase of infestation occurred during 1938. Light epidemic infestation appeared over large areas of normal infestation. A moderate epidemic developed on the sites formerly occupied by the light epidemic, and a heavy epidemic appeared over a large portion of the area previously occupied by the moderate epidemic. Increment cores from trees on check plots show that there has been some improvement of tree growth in recent years, but it still is much below normal.

Selective logging of high beetle hazard trees is believed to be the solution of the present western pine beetle problem.

Table 1.--Description of Check Plots on Mt. Hood National Forest.

Area and Unit	Plot Name	Location T.	Location R.	Location Sec.	Elevation	Type	Site	Timbered Acres	Pine Volume as of Jan. 1, 1939
East Side									
Dufur	8-Mile Creek	2	11	1N	3000	21	4	320	2,348,175
Wamic	Happy Ridge	3	11	26S	2750	20.5	4	320	3,781,955
Wamic	Burnt Mill	4	11	23S	2250	20.5	4	320	2,424,820

Table 2.—Ponderosa Pine Distribution by Areas and Units as of Jan. 1, 1937

Area and Unit	Pine Acreage		Ponderosa Pine Volume Mbm
	Total	Virgin	
East Side			
Mosier	26,000	19,000	88,850
Dufur	61,060	38,060	294,006
Wamic	90,600	83,600	611,560
Area total	177,660	140,660	994,416
Warm Springs			
Bear Spring	37,700	31,700	177,736
Total for Forest	215,360	172,360	1,172,152

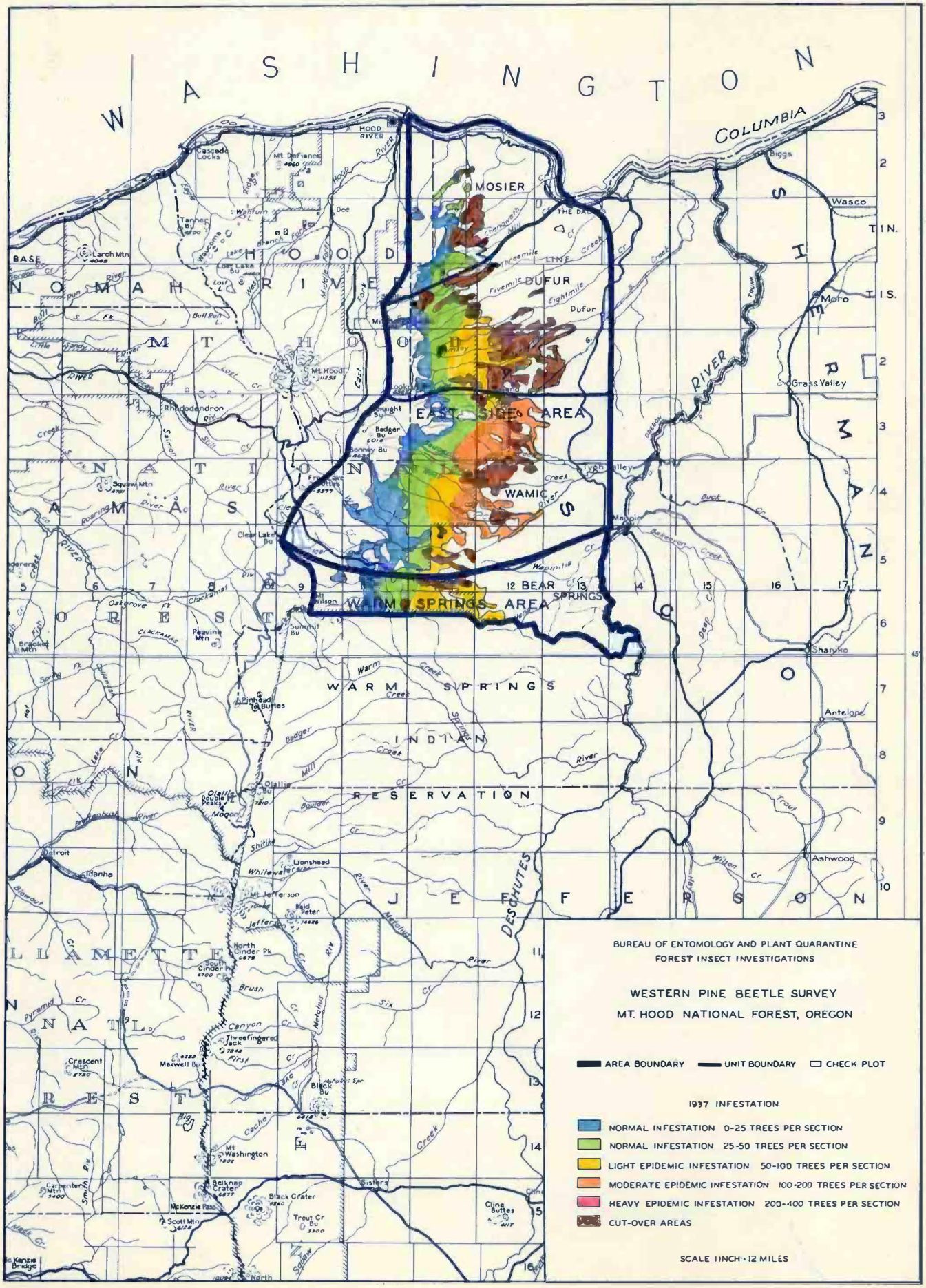
Table 3.—Summary of Pine-Beetle Damage and Comparison of Loss Trends on Check Plots, 1937-1939

Plots	1937 Loss					1938 Loss					1939 Loss				
											Estimated				
	Trees	Volume	Bd. ft. per Acre	% of Stand	Ratio 1937 to 1936	Trees	Volume	Bd. ft. per Acre	% of Stand	Ratio 1938 to 1937	Trees Marked	Total Trees	Volume	Bd. ft. per Acre	% of Stand	Ratio 1939 to 1938
Eight Mile Creek	35	17,170	53	.73	2.06	57	31,755	99	1.36	1.86	28	46	27,400	86	1.20	.87
Happy Ridge	69	45,490	142	1.20	1.29	111	72,225	226	1.96	1.59	88	147	94,500	295	2.62	1.31
Burnt Hill	72	41,260	129	1.70	1.17	115	60,000	188	2.52	1.46	45	76	43,300	134	1.83	.71
Totals for All Plots	176	103,920	108	1.22	1.51	283	163,980	171	1.95	1.64	161	269	165,200	172	2.00	.96

Table 4.--Estimate of Ponderosa Pine Losses for 1937 and 1938

Infestation Areas and Units	Year	Pine Acreage: Total	Pine Acreage: Virgin	Pine Volume Mbm	Beetle Losses: Trees	Beetle Losses: Volume Mbm	Beetle Losses: Bd.ft. per Acre	Beetle Losses: % of Stand
East Side								
Mosier	1937	26,000	19,000	88,850	265	165	6	.19
	1938	26,000	19,000	88,850	453	270	10	.30
Dufur	1937	61,060	38,060	294,006	2207	1234	20	.42
	1938	61,060	38,060	294,006	4250	2530	41	.86
Wamic	1937	90,600	83,600	611,560	7535	4210	47	.69
	1938	90,600	83,600	603,560	11227	6736	75	1.12
Area Total	1937	177,660	140,660	994,416	10007	5609	32	.56
	1938	177,660	140,660	986,416	15930	9536	53	.97
Warm Springs								
Bear Spring	1937	37,700	31,700	177,736	1768	1008	26	.57
	1938	37,700	31,700	177,000	3270	1865	49	1.05
Both Area Totals	1937	215,360	172,360	1,172,152	11775	6617	30	.56
	1938	215,360	172,360	1,163,416	19200	11401	53	.98

MAP 2.


WASHINGTON
COLUMBIA
MOSIER
DUFUR
EAST SIDE AREA
WAMIC
WARM SPRINGS AREA
BEAR SPRINGS
WARM SPRINGS INDIAN RESERVATION
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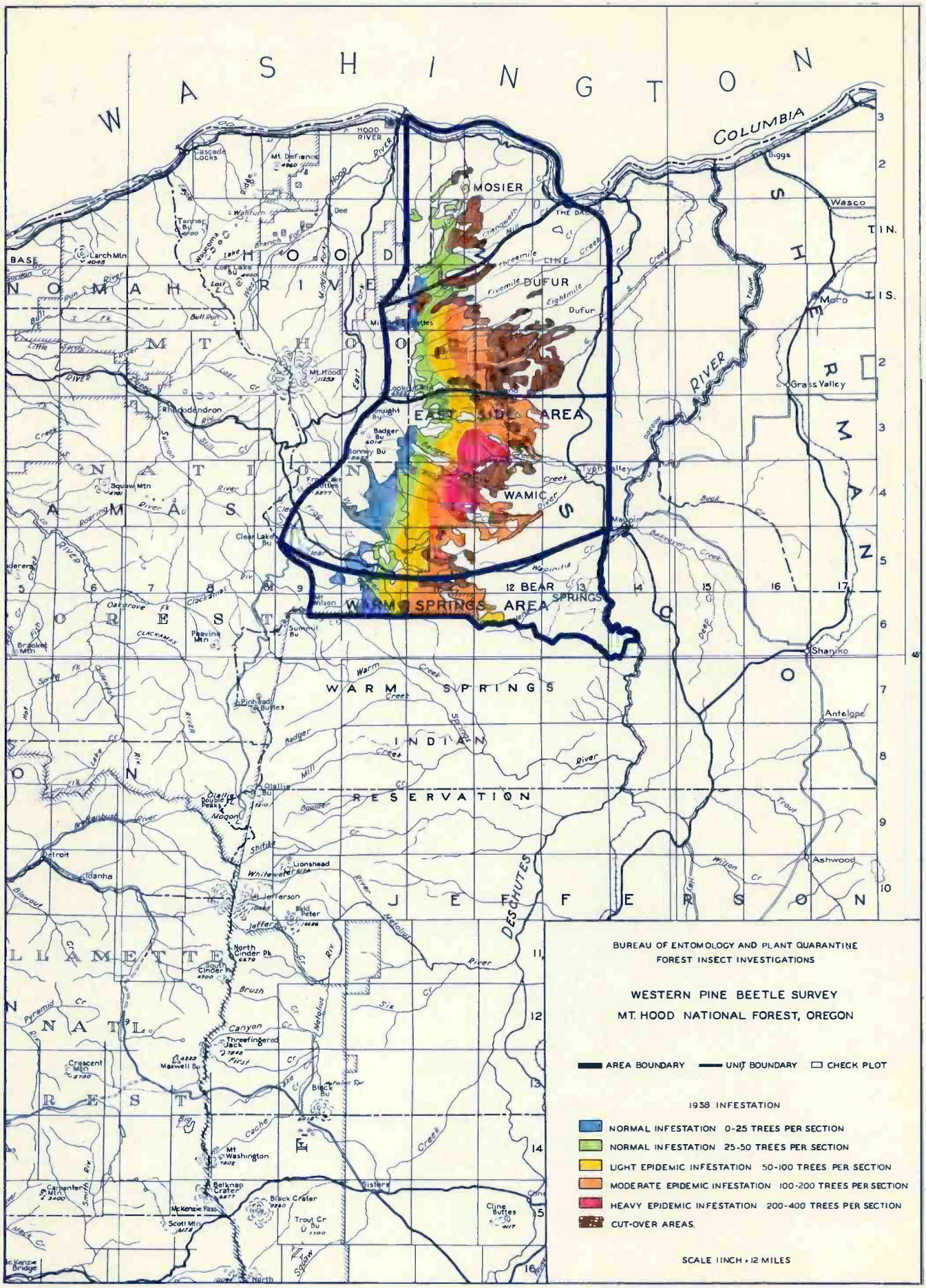
MAP 3.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CLACKAMAS
WASCO
SHERMAN
Cascade Locks
Hood River
Mt. Defiance
Biggs
Wasco
Dufur
Grass Valley
Moro
Shaniko
Antelope
Ashwood
Madras
Metolius
Sisters
Black Crater
Mt. Washington
Mt. Jefferson
Mt. Hood
Olallie
Detroit
Idanha
Lionshead
Whitewater
Bald Peter
North Cinder Pk.
South Cinder Pk.
Crescent Mtn.
Threefingered Jack
Maxwell Bu.
Carpenter Mtn.
Belknap Crater
McKenzie Pass
Scott Mtn.
Trout Cr Bu.
Cline Buttes
Rhododendron
Squaw Mtn.
Clear Lake Bu.
Summit Bu.
Pinhead Buttes
Larch Mtn.
Tanner Bu.
Lost Lake Bu.
Badger Bu.
Bonney Bu.
Mt. Wilson
Paquina Mtn.
Bracket Mtn.
Pinhead Buttes
Double Peak
Mogon
Jefferson
Brush
Canyon
Pyramid Cr.
Cache
Big Lake
Hood River
Middle Fork
West Fork
Lost Cr.
Bull Run
Little Sandy
Roaring River
Oakgrove Fk.
Clackamas River
Still Cr.
Salmon
Badger Creek
Warm Springs River
Deep
Buck
Wapinitia
Trout
Wilson
Boulder
Mill
Shitike
Lake Fk.
Spring Fk.
Hot
Quinn
Blowout
Pyramid
Six
Brush
Canyon
Cache
Big Lake
Smith
Black
Fall
Lake
Trout Cr
Squaw
Metolius
Deschutes
Crooked
Agency
Lake Billy Chinook
Round Butte Dam
Opal Springs
Culver
Metolius
Sisters
Cline Buttes
Black Crater
Trout Cr Bu.
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McKenzie Pass
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